

Sullivan Landfill
1986 to present
TCH

Original

**1995 ANNUAL REPORT
SULLIVAN LANDFILL
SULLIVAN, MISSOURI**

TES

Site:	OAK GROVE
ID#	MAP 981717036
Break:	1.0
Other:	OUT#1
4-96	
07PZ	

Prepared for:

SULLIVAN LANDFILL PRP GROUP

Prepared by:

ABB Environmental Services, Inc.
110 Free Street
Portland, ME 04112

APRIL 1996

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SUPERFUND RECORDS

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APR 8 1996

**1995 ANNUAL REPORT
SULLIVAN LANDFILL
SULLIVAN, MISSOURI**

HAZARDOUS WASTE PROGRAM
MISSOURI DEPARTMENT OF
NATURAL RESOURCES

Prepared for:

SULLIVAN LANDFILL PRP GROUP

Prepared by:

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SULLIVAN, MISSOURI

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page No.</u>
1.0	SUMMARY	1
2.0	LANDFILL CLOSURE ACTIVITIES	2
2.1	CONSTRUCTION	2
2.2	GRASS COVER	2
2.3	INSPECTIONS/MAINTENANCE	2
2.4	SETTLEMENT MONITORING	3
2.5	LEACHATE COLLECTION	3
2.6	CLOSURE PLAN	3
3.0	GROUNDWATER SAMPLING PROGRAM	4
4.0	ANALYTICAL RESULTS	4
4.1	GROUNDWATER ANALYSES - VOLATILE ORGANICS COMPOUNDS	4
4.2	GROUNDWATER RESULTS - INORGANIC ELEMENTS	5
4.3	ANALYTICAL QUALITY ASSURANCE QUALITY CONTROL	6
5.0	CONCLUSIONS	6
6.0	RECOMMENDATIONS	7

TABLES AND FIGURES

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

APPENDICES

1.0 SUMMARY

This report presents a summary of 1995 groundwater sampling and landfill closure activities completed at the Sullivan Landfill site in Sullivan, Missouri. These activities include cap construction, inspection/maintenance, settlement monitoring, leachate collection, and development of the final closure plan. This annual report also summarizes results from the December 1995 groundwater sampling event. As documented in this report, construction of the landfill cap and associated leachate collection system was completed in 1995. The rate of leachate volume being collected has declined significantly due to the installation of the landfill cap. The groundwater sampling results continue to confirm that the groundwater flow system in the vicinity and downgradient of the site has not been impacted by landfill wastes.

The groundwater sampling and analysis program was conducted under the direction of ABB Environmental Services, Inc. (ABB-ES). The groundwater analysis was conducted by National Environmental Testing Inc. (NET) and the sample collection was performed by O.A. Technical Services Inc. From December 15 to 24, 1995, groundwater samples were collected from six monitoring wells, as well as the Voss well (Figure 1). One trip blank and a sample blank (QS-1) were taken for data validation purposes. Groundwater samples were analyzed for volatile organic compounds (VOCs) and the inorganic elements barium, chromium, and lead. The groundwater monitoring program is a continuation of sampling conducted since 1993 in accordance with the Groundwater Monitoring Plan which was approved by the Missouri Department of Natural Resources (MDNR) on November 2, 1993.

The Annual groundwater sample results, which include the December, 1995 groundwater sample round, are consistent with previous results at the landfill site. All VOCs and inorganic compounds were well below both federal and state Maximum Contaminant Level (MCL) criteria. The only VOCs detected were trichloroethene (TCE), trichlorofluoromethane (TCFM), dichlorofluoromethane (DCFM), dichlorodifluoromethane (DDFM), 1,1-Dichloroethane (1,1-DCA), and 1,1,1-Trichloroethane (1,1,1-TCA). The TCFM, DCFM, DDFM, and 1,1,1-TCA concentrations were all below the federal and MDNR standards. The 1,1,-DCA concentrations were low (<8.1 µg/L) and there are no regulatory standards for this compound in groundwater. The only inorganic element detected in the sampled wells was barium, which was well below both the Missouri state MCL criteria (1 mg/L).

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2.0 LANDFILL CLOSURE ACTIVITIES

This section describes landfill cap and leachate collection system construction, maintenance, and monitoring activities during 1995.

2.1 CONSTRUCTION

O'Brien and Gere Technical Services, Inc. (OBGT) completed construction of the landfill cap and the leachate collection system on January 26, 1995. Construction began on June 1, 1994. OGBT demobilized much of their equipment and trailers during February 1995, but maintained some equipment to complete punch list items over the following two months.

On July 10, 1995 ABB-ES submitted the Final Construction Report to the MDNR. The report included a chronological description of closure construction activities, copies of weekly construction reports, landfill cover soil and geomembrane QA/QC testing results, and record drawings.

2.2 GRASS COVER

During the spring and summer, a thick grass cover developed on the landfill cap. The grass was mowed during the summer. Because of the dry weather, only one cutting was necessary. A second application of grass seed and fertilizer was performed on October 25, 1995. The PRP Group made this investment to encourage continuation of a thick grass cover to provide further protection for cover soil against erosion.

2.3 INSPECTIONS/MAINTENANCE

During the period from January 26 (construction completion) to March 31, 1995 (site walkover), landfill inspections were performed by OGBT. The inspections noted that the landfill cap maintained its integrity well during the winter weather. Copies of the inspection reports are included in Appendix A.

2.4 SETTLEMENT MONITORING

Cap settlement within an acceptable range was observed at the seven settlement stations monitored during 1995 (see Figure 1). Elevation measurements were taken

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in January (baseline, at construction completion), and again in October and December (see Table 1). Cap settlement during the year ranged from 0.06 feet (at SP-3) to 0.35 feet (at SP-4). SP-4 is located in an area of the landfill where more total fill (i.e., subgrade soil and cap soil) was placed during closure construction than in other landfill areas. Thus it is reasonable to observe more settlement in this location than in other areas of the landfill. There is no noticeable depression on the landfill cover at SP-4, and no standing water has been observed. A recent measurement at SP-4 (march 1996) showed only a 0.02 foot settlement since December 1995.

2.5 LEACHATE COLLECTION

Through Decembe 31, 1995 a total of 402,500 gallons of leachate were removed from the landfill and disposed of at the St. Louis Metropolitan Sewer District's wastewater facility. This amount includes approximately 200,000 gallons initially impounded at the perimeter seep locations prior to landfill closure. The volume of leachate collected at the site is consistent with volume estimates previously calculated and submitted to the MDNR in the October 1993 Closure Plan Report.

As shown in Figure 2, the rate of leachate being collected has declined significantly and the installation of the landfill cap has resulted in a significant reduction in the rate of leachate generated from the site. The rate of leachate being collected from the landfill in December 1995 (i.e., approximately 3,500 gallons/week) is lightly lower than the average range of leachate flow rates (4,000 - 15,000 gallons/week) estimated in the Closure Plan Report.

2.6 CLOSURE PLAT

ABB-ES is currently preparing and will submit to MDNR in May 1996 a Draft Closure Plat suitable for registering with the county recorder of deeds. The Plat will include a legal description of the landfill closure limits, and will conform to requirements of MDNR's Solid Waste Management Program.

3.0 GROUNDWATER SAMPLING PROGRAM

Groundwater samples were collected from December 15 to 24, 1995. Field data records are included in Attachment 1. Monitoring wells were purged in accordance

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with the approved Groundwater Monitoring Sampling Plan. Both filtered and unfiltered samples were collected at all well locations and analyzed for barium, chromium, and lead.

4.0 ANALYTICAL RESULTS

The analytical results for the December 1995 sample round are summarized in Table 3 and are presented in Attachment 2. The groundwater results are discussed in the following subsections.

4.1 GROUNDWATER ANALYSES - VOLATILE ORGANICS COMPOUNDS

No VOCs were detected in on-site wells above either federal or state MCLs. The only inorganic compound detected in the on-site wells was barium, which was also well below federal and state MCLs. The only VOCs detected in on-site wells were TCFM, DCFM, DDFM, 1,1-DCA, TCE, and 1,1,1-TCA.

Groundwater samples were analyzed for VOCs using U.S. Environmental Protection Agency (USEPA) Method SW846 8240B. As shown in Attachment 2, VOCs detected in site monitoring wells were TCE, TCFM, DCFM, DDFM, 1,1-DCA, and 1,1,1-TCA.

The TCFM concentrations ranged from 2.2 to 175 µg/L, DCFM concentrations ranged from 4.2 to 161 µg/L, and the DDFM concentrations ranged from 2.4 to 7.5 µg/L. These compounds were below all state MCL criteria. Although no federal Maximum Concentration Levels (MCLs) exist for these compounds, the MDNR has set standards at 1,000 µg/L for TCFM and 2,000 µg/L for DCFM.

TCE was detected at MW-101, MW-105, and the Voss Well at 4.1, 2.9, and 3.1 µg/L, respectively. Both the federal and Missouri MCLs for TCE are 5 µg/L. 1,1-DCA was detected at MW-102B, MW-105, and the Voss Well with concentrations ranging from 1.7 to 8.1 µg/L. There are no MDNR or federal regulatory standards for this compound in groundwater. 1,1,1-TCA was detected at MW-103, MW-105, and the Voss Well at concentrations ranging from 1.8 to 3.6 µg/L. Both the federal and Missouri MCL for 1,1,1-TCA is 200 µg/L.

4.2 GROUNDWATER RESULTS - INORGANIC ELEMENTS

Barium was detected at concentrations below federal and state MCL criteria. Concentrations ranged from .056 to .139 milligrams per liter (mg/L) for total metals (unfiltered). Dissolved, or filtered samples, were detected at similar concentrations and ranged from .057 to .145 mg/L. The filtered and unfiltered results are very similar primarily due to the lack of any suspended particles in the water and as evidenced by the low turbidity of the water. The filtered groundwater representative of actual concentrations within the groundwater flow system. The federal MCL for barium is 2 mg/L while the Missouri MCL is 1 mg/L. Chromium and lead was not detected in any of the wells.

The analytical methods used for inorganics were USEPA Method SW-846 S-6010A for total and dissolved barium and chromium and USEPA Method 239.2 for total and dissolved lead.

4.3 ANALYTICAL QUALITY ASSURANCE QUALITY CONTROL

The VOC data were evaluated for holding time and for blank contamination using "National Functional Guidelines for Organic Data Review" (USEPA, December, 1990). The inorganics data were evaluated for holding time and for blank contamination using "Laboratory Data Validation Functional Guidelines for Evaluation Inorganics Analysis" (USEPA, October 1989). The laboratory submitted the following additional quality control information for all methods: continuing calibration verification, method blank, and laboratory control standard. In addition, matrix spike/matrix spike duplicate and duplicate information was provided for methods SW-846 6010A and EPA-239.2.

No contamination was found in the method blank or in the trip and source blanks associated with the VOC samples. Holding time criteria were met. Evaluation of other quality control information provided indicated all criteria were met for the VOC samples.

No contamination was detected in the method blank or in the source blank for the inorganic analysis. Holding times were acceptable and evaluation of other quality control information provided showed all criteria were met for the inorganic analysis.

5.0 CONCLUSIONS

As documented in this 1995 annual report, construction of the landfill cap and associated leachate collection system was completed in 1995. The rate of leachate volume being collected has declined significantly and the installation of the landfill cap has resulted in a significant reduction of leachate generated from the site.

The December 1995 groundwater analytical data are consistent with previous results of groundwater samples collected at the site and indicate that the groundwater flow system has not been impacted by landfill wastes. Although the landfill may be a source of the VOC compounds, including DCFM, DDFM, and TCFM, it is certainly not the only source for these compounds in the area. Groundwater samples have been collected from landfill wells on a quarterly basis since May, 1993. A total of 14 sample rounds have been collected at the landfill site since May, 1993. DDFM, TCFM, and DCFM have been detected in site wells, with no detections at B-201 and only infrequent detections at MW-102A. Low levels of TCE, 1,1-DCA and 1,1,1-

DCA have been periodically detected at MW-101, MW-105, Voss well, MW-102B, and MW-103.

6.0 RECOMMENDATIONS

Based on a review of groundwater data collected at the site over the past three years the following recommendations are proposed to the groundwater sampling program in 1996:

- Given the consistent correlation between total (unfiltered) and Dissolved (filtered) barium concentrations, ABB-ES has recommended that all future sampling rounds for barium be for Total (unfiltered) conditions. In addition, lead and chromium compounds have been absent in site wells over the past 3 years of sampling and ABB-ES also recommends dropping these two analytes from the program.
- Given the consistent concentration trends observed in site wells, ABB-ES recommends adjusting the sampling program to occur on an annual basis in 1996. Groundwater samples will be obtained the last week of April 1996.

TABLE 1
VERTICAL SURVEY RESULTS AT SETTLEMENT PLATFORMS
SULLIVAN, MO MUNICIPAL LANDFILL

Settlement Platform No.	VERTICAL ELEVATION MEASUREMENTS*				
	Jan. 1995 (Baseline)	June 1995	Oct. 1995	Dec. 1995	March 1996
SP 1	931.24		931.15	931.02	931.00
SP 2	928.62		928.58	928.45	928.45
SP 3	921.61		921.55	921.55	921.50
SP 4	926.25		926.04	925.90	925.88
SP 5	920.09		919.97	919.84	919.83
SP 6	910.09		909.98	909.84	909.85
SP 7	925.95		925.87	925.76	925.74

*U.S. Geological Survey Datum

TABLE 2
GROUNDWATER CHEMICAL DATA
1995 ANNUAL REPORT

SULLIVAN LANDFILL
SULLIVAN, MISSOURI

DATE SAMPLED	Variable Organic Compounds (µg/L)	NW-101				NW-105				NW-105			
		5/23/95	7/22/95	20/3/95	9/30/95	5/24/94	9/5/94	5/23/95	9/15/95	5/23/95	9/15/95	5/23/95	9/15/95
Trichloroethane	4.1	--	--	--	--	4.2	1.8	--	--	2.0	--	2.2	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-Pentanone	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Heptane	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromoethane	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylnenoate) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics (µg/L)													
Total	2,400	1,600U	--	--	--	--	--	--	--	--	--	--	--
Auminum	--	--	--	--	--	--	--	--	--	--	--	--	--
Anorthite	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	90	--	--	--	--	--	--	--	--	--	--	--	--
Boron	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	20	--	--	--	--	--	--	--	--	--	--	--	--
Iron	3,000	3,000	--	--	--	--	--	--	--	--	--	--	--
Lead	10	6	--	--	--	--	--	--	--	--	--	--	--
Magnesium	41,000	--	26,000	--	28,100	--	--	--	--	--	--	--	--
Manganese	120	50	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	15,000	9,300	--	6,400	--	7,200	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	130	--	--	--	--	--	--	--	--
Others (µg/L)													
Chloride	17,000	13,000	13,000	9,000	NR	NR	NR	NR	NR	NR	NR	NR	NR
Sulfate	10,000	20,000	10,000	230,000	NR	NR	NR	NR	NR	NR	NR	NR	NR
Alkalinity (Bicarbonate)	--	--	9,000	330,000	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total Suspended Solids	--	--	--	--	NR	NR	NR	NR	NR	NR	NR	NR	NR
Coliform	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES:

U = Estimated Value

NR = Not Required - Instrument not included in the sampling program at the time

-- = Not Detected

TCLP = Toxicity Characteristic Leaching Procedure

Q5 = Sample Blank

TABLE 2 (Continued)
GROUNDWATER CHEMICAL DATA

SULLIVAN LANDFILL
SULLIVAN, MISSOURI

DATE SAMPLED	Volatile Organic Compounds (µg/L)	MW - 102A			MW - 102B			MW - 102C		
		5/23/92	7/22/92	2/1/93	8/1/93	5/24/94	8/25/95	9/2/95	9/2/95	12/1/95
Dichloroethane										
Acetone	--	--	--	--	--	--	--	--	--	--
2-Butanone	--	--	22	--	--	--	--	--	--	--
4-Methyl-2-Pentanone	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--
Ethyl Benzene	--	--	--	--	--	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--	--	--	--	--
DibromoChloromethane	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--
TrichloroFluoromethane	--	--	--	--	--	--	--	--	--	--
Dichlorofluoromethane	--	--	--	--	--	--	--	--	--	--
Serviceable Organic Compounds (µg/L)	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--
2 Methylphenol	--	--	--	--	--	--	--	--	--	--
2,4 Dinitrophenol	--	--	--	--	--	--	--	--	--	--
6392-Acryloylphenoxide	--	--	--	--	--	--	--	--	--	--
Inorganics (µg/L)										
Aluminum	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Antimony	--	--	--	--	--	--	--	--	--	--
Barium	130	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--
Iron	5	60	10	10	10	10	10	10	10	10
Led	--	--	4,600	220	54	54	54	54	54	54
Magnesium	--	--	--	--	--	--	--	--	--	--
Manganese	24,000	--	--	21,000	18,000	18,000	18,000	18,000	18,000	18,000
Ne�a	--	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	5,100	--	--	--	--	--	--
Zinc	--	--	--	--	300	78	78	78	78	78
Others (µg/L)										
Chloride	4,000	--	4,000	4,000	NR	NR	NR	NR	NR	NR
Sulfate	12,000	16,000	15,000	15,000	NR	NR	NR	NR	NR	NR
Alkalinity Dissolved	225,000	310,000	680,000	680,000	NR	NR	NR	NR	NR	NR
Total Suspended Solids	NR	360,000	NR	NR	NR	NR	NR	NR	NR	NR
Total Dissolved Solids	NR	250,000	NR	NR	NR	NR	NR	NR	NR	NR
Cyanide	NR	--	--	--	6	6	6	6	6	6

NOTES:

J = Estimated Value
NR = Not Required - Imminently not included in sampling program at this time.

** = Not Detected
I = Inert Chemicals Located in closure
CS = Sampled Blank

TABLE 2 (continued)
GROUNDWATER CHEMICAL DATA

SULLIVAN LANDFILL
SULLIVAN, MISSOURI

DATE SAMPLED	Volatile Organic Compounds (µg/L)	MW - 1628				3/24/95				6/26/95				9/22/95 (Dip)				9/22/95 (Dip)				12/10/95							
		5/24/92	7/22/92	2/12/93	2/12/93 (Dip)	6/3/93	6/3/93 (Dip)	5/2/94	5/2/94 (Dip)	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6
Toluene	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-Pentanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethy Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromoethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Solvent-Soluble Organic Compounds (µg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics (µg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	17,000	1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	150	60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium	110,000	56,000	54,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	46,000	1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	64,000	33,000	30,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	970	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	90	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	13,000	11,000	9,700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Others (µg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride	13,000	--	22,000	15,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	14,000	19,000	16,000	15,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity Bicarbonate	220,000	260,000	240,000	210,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	700,000	430,000	NR	NR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Dissolved Solids	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES:

J = Estimated Value
 NR = Not Reported - Insufficiently not measured in a sampling program at this time.
 T = Total
 TC = Toxic Chemical Testable Concentration
 OS = Sample Blank

TABLE 2 (Continued)
GROUNDWATER CHEMICAL DATA

SULLIVAN LANDFILL
SULLIVAN, MISSOURI

DATE SAMPLED	5/20/82	7/22/82	2/11/83	8/30/83	5/24/84	9/10/84	MW - 103	12/28/85	9/28/86	12/19/86
Volatile Organic Compounds (µg/L)										
Trichloroethylene	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--
2-Butanone	--	--	--	--	--	--	--	--	--	--
o-Methyl-2-Pentanone	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--
Ethy Benzene	--	--	--	--	--	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--	--	--	--	--
Dibromoethane	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--
Dichlorobromomethane	--	--	--	--	--	--	--	--	--	--
Semi-volatile Organic Compounds(µg/L)	--	--	--	--	--	--	--	--	--	--
4-Methyl Phenol	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--
2 Methylphenol	--	--	--	--	--	--	--	--	--	--
2,4 Dimethylphenol	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl) Phthalate	--	--	--	--	--	--	--	--	--	--
Inorganic Constituents	--	--	--	--	--	--	--	--	--	--
Aluminum	5,300	48,000	-	-	-	-	-	-	-	-
Antimony	--	6	--	--	--	--	--	--	--	--
Barium	--	70	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--
Cadmium	--	38,000	260,000	--	--	--	--	--	--	--
Chromium	--	--	10	--	--	--	--	--	--	--
Copper	--	--	100	--	--	--	--	--	--	--
Iron	--	3,900	59,000	--	--	--	--	--	--	--
Lead	--	10	180	--	--	--	--	--	--	--
Manganese	--	19,000	160,000	15,000	17,100	--	--	--	--	--
Manganese	--	60	1,100	--	--	--	--	--	--	--
Nickel	--	--	100	--	--	--	--	--	--	--
Potassium	--	6,300	6,300	--	--	--	--	--	--	--
Sodium	--	7,300	66,000	--	--	--	--	--	--	--
Vanadium	--	--	120	--	--	--	--	--	--	--
Zinc	--	80	230	--	--	--	--	--	--	--
Others (µg/L)	--	--	--	--	--	--	--	--	--	--
Chloride	32,000	16,000	19,000	--	--	--	--	--	--	--
Sulfate	--	--	--	140,000	120,000	--	--	--	--	--
Alkalinity Bisulfate	--	540,000	NR	3,500,000	NR	--	--	--	--	--
Total Suspended Solids	--	NR	NR	3,600,000	NR	--	--	--	--	--
Total Dissolved Solids	--	NR	NR	NR	NR	--	--	--	--	--
Change	--	--	--	--	--	--	--	--	--	--

NOTES:

J = Estimated Value
NR = Not Reported - Intentionally not included in quality control program at this time.

* = Not Detected

ICP = Traceable Characteristic Lanthanide Oxide

OS = Sampled Blank

TABLE 2 (Continued)
GROUNDWATER CHEMICAL DATA

SULLIVAN LANDFILL
SULLIVAN, MISSOURI

DATE SAMPLED	MW - 104										MW - 05										9/22/95		
	5/21/92	7/23/92	2/13/93	8/21/93	5/24/93	6/21/93	7/22/93	7/22/92 (DUP)	7/22/92	7/22/93	6/30/93	5/21/94	9/5/94	3/29/95	6/20/95	7/22/95	6/20/95	9/22/95	6/20/95	9/22/95			
Volatile Organic Compounds (µg/L)																							
Trichloroethane	4.4	11	11	11	9	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	2.9	11	
Acetone	4.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
2-Butanone	30.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Toluene	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
1,1-Dichloroethane	—	—	—	—	—	—	—	—	—	—	21	—	—	—	—	—	—	—	—	—	—	—	
Methylene Chloride	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—	—	
1,1,1-Trichloroethane	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
2-Hexanone	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Ethyl Benzene	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Toluol Xylenes	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Dibromochloromethane	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Dichlorodifluoromethane	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Trichlorofluoromethane	—	—	—	—	—	—	—	—	—	—	NR	—	—	—	—	—	—	—	—	—	—	—	
Bromodifluoromethane	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Semi-volatile Organic Compounds(g/L)	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
4-Methylphenol	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Naphthalene	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Phenol	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
2-Methylphenol	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
2,4-Dimethylphenol	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Bis(2-ethylhexyl)Phthalate	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Inorganics (mg/L)																							
Aluminum	—	—	—	—	—	—	—	—	—	—	10,000	—	—	—	—	—	—	—	—	—	—	—	
Arsenic	—	—	—	—	—	—	—	—	—	—	56	300	120	120	120	120	120	120	120	120	120	120	
Barium	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Beryllium	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Boron	—	—	—	—	—	—	—	—	—	—	57,000	180,000	90,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	
Calcium	—	—	—	—	—	—	—	—	—	—	60	—	—	—	—	—	—	—	—	—	—	—	
Copper	—	—	—	—	—	—	—	—	—	—	60	—	—	—	—	—	—	—	—	—	—	—	
Iron	—	—	—	—	—	—	—	—	—	—	60	—	—	—	—	—	—	—	—	—	—	—	
Led	—	—	—	—	—	—	—	—	—	—	60	—	—	—	—	—	—	—	—	—	—	—	
Manganese	—	—	—	—	—	—	—	—	—	—	33,000	300,000	32,000	31,200	100,000	49,000	49,000	31,200	31,200	31,200	31,200	31,200	
Nickel	—	—	—	—	—	—	—	—	—	—	740	—	—	—	—	—	—	—	—	—	—	—	
Potassium	—	—	—	—	—	—	—	—	—	—	5,800	—	—	—	—	—	—	—	—	—	—	—	
Sodium	—	—	—	—	—	—	—	—	—	—	6,300	—	—	—	—	—	—	—	—	—	—	—	
Vanadium	—	—	—	—	—	—	—	—	—	—	60	—	—	—	—	—	—	—	—	—	—	—	
Zinc	—	—	—	—	—	—	—	—	—	—	320	—	—	—	—	—	—	—	—	—	—	—	
Others (µg/L)											3,000	—	—	—	—	—	—	—	—	—	—	—	
Chloride	—	—	—	—	—	—	—	—	—	—	NR	21,000	13,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	
Sulfate	—	—	—	—	—	—	—	—	—	—	7,000	NR	470,000	280,000	240,000	310,000	310,000	310,000	310,000	310,000	310,000	310,000	310,000
Aluminum Bicarbonate	—	—	—	—	—	—	—	—	—	—	1,300,000	NR	13,000,000	NR	440,000	230,000	390,000	390,000	390,000	390,000	390,000	390,000	390,000
Total Suspended Solids	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Total Dissolved Solids	—	—	—	—	—	—	—	—	—	—	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Cyanide	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

NOTES
— Estimated Value
NR = Not Recorded — Interpolated — not included in g

ICP = Ion Current Concentration & Conductivity
OS = Optical Spectroscopy

TABLE 2 (Continued)
GROUNDWATER CHEMICAL DATA

SULLIVAN LANDFILL
SULLIVAN, MISSOURI

DATE SAMPLED	Neobolid Residence	Volatile Organic Compounds (ug/L)				Volatile Inorganic Compounds (ug/L)				Inorganics (ug/L)				Other (ug/L)				Total Dissolved Solids (mg/L)			
		2/12/83	6/21/82	5/24/84	9/28/84	3/29/85	9/22/85	9/28/85	9/22/85	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Trichloroethylene	5.0	--	--	2.5	2.4	--	2.0	2.7	2.8	--	--	--	--	--	--	--	--	--	--	3.1	--
Acetone	2-Butanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-Pentanone	Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	Methylene Chloride	--	--	1.9	2.0	--	2.3	3.1	2.6	--	--	--	--	--	--	--	--	--	--	3.1	--
1,1,1-Trichloroethane	2-Hexanone	2.2	--	--	1.7	1.7	1.5	1.6	1.5	--	--	--	--	--	--	--	--	--	--	1.6	--
Ethyl Benzene	Total Xylenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloroethane	Dichlorotetrachloroethane	NR	NR	120	15.1	3.9	3.6	4.7	5.2	--	--	--	--	--	--	--	--	--	--	5.7	7.0
Dichlorofluoromethane	Nitrobenzene	NR	NR	150	19.0	79.9	70.0	70.1	80.3	--	--	--	--	--	--	--	--	--	--	81.4	86.7
Semi-volatile Organic Compounds(ug/L)	4-Methylphenol	NR	NR	NR	NR	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	NR	NR
Naphthalene	Phenol	NR	NR	NR	NR	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	NR	NR
2 Methylphenol	2,4 Dinitrophenol	NR	NR	NR	NR	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	NR	NR
Bis(2-Ethylhexyl)Phthalate	Inorganics (ug/L)	NR	NR	NR	NR	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	NR	NR
Others (ug/L)	Aluminum	--	300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NR	NR
Asenic	Barium	--	--	80	76	078	076	082	093	082	082	078	069	065	060	060	060	060	060	NR	NR
Beryllium	Cadmium	--	--	--	--	42,800	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	ND.	--	41,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	Iron	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NR	NR
Lead	Magnesium	--	--	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NR	NR
Manganese	Nickel	--	--	--	23,000	22,000	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Potassium	Sodium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NR	NR	NR
Sulfur	Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NR	NR	NR
Chloride	Sulfate	--	--	--	7,000	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Alkalinity Bicarbonate	Total Suspended Solids	--	--	--	17,000	17,000	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total Dissolved Solids	Cyanide	--	--	--	150,000	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
 J = Estimated Value
 NR = Not Recorded - Laboratory not on hand or a sampling problem at the time
 -- = Not Detected
 TDS = Total Dissolved Solids
 Q5 = Sampled Blank

TABLE 2 (Continued)
GROUNDWATER CHEMICAL DATA

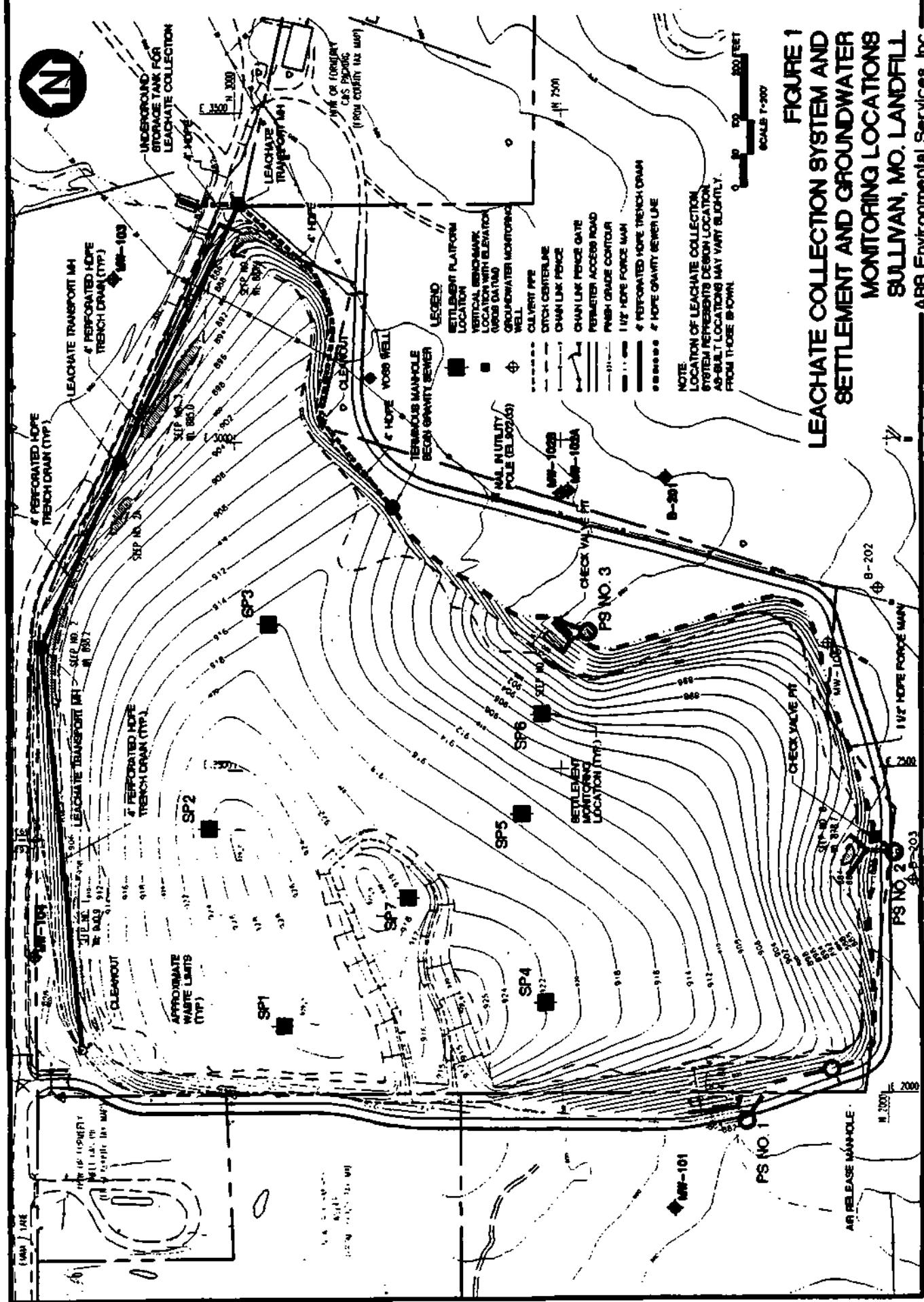
SULLIVAN LANDFILL

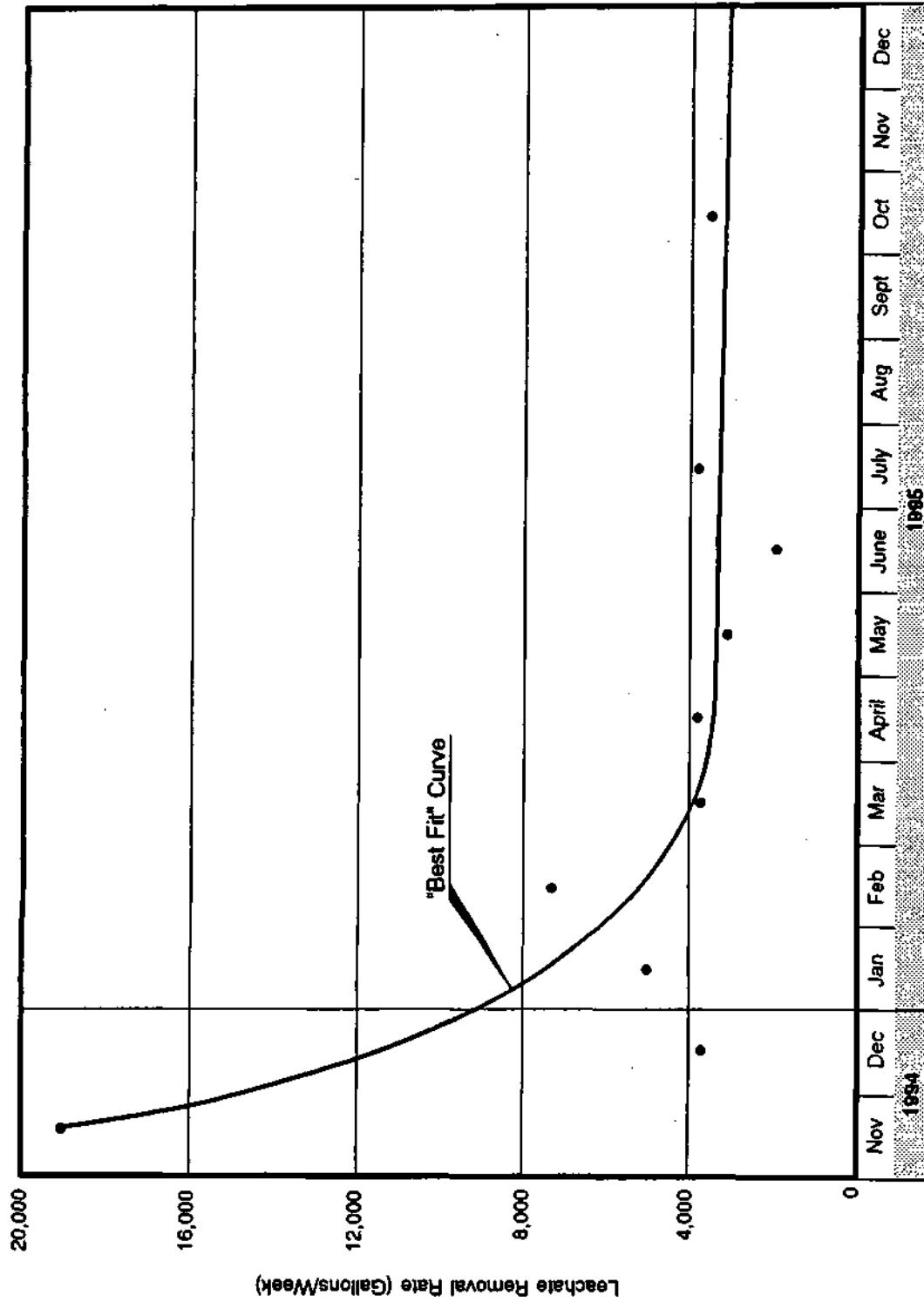
- Estimated Value
- The true value - Inherently most accuracy of all

- Not Described
- - - - - Unlikely Characteristic: Lactate P reduces o

- Sample Block

0039611T2.WK17





Note: Construction of impermeable landfill cap barrier
was completed on November 11, 1994.

FIGURE 2
SULLIVAN LANDFILL CLOSURE
LEACHATE REMOVAL RATES OVER TIME

ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
1,1-DCA	1,1-Dichloroethane
DBCM	dibromochloromethane
DCFm	dichlorofluoromethane
DDFM	dichlorofluoromethane
MCL	Maximum Concentration Level
MDNR	Missouri Department of Natural Resources
mg/L	milligrams per liter
µg/L	micrograms per liter
1,1,1-TCA	1,1,1-Trichloroethane
TCE	trichloroethene
TCFM	trichlorofluoromethane
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

ABB Environmental Services, Inc.